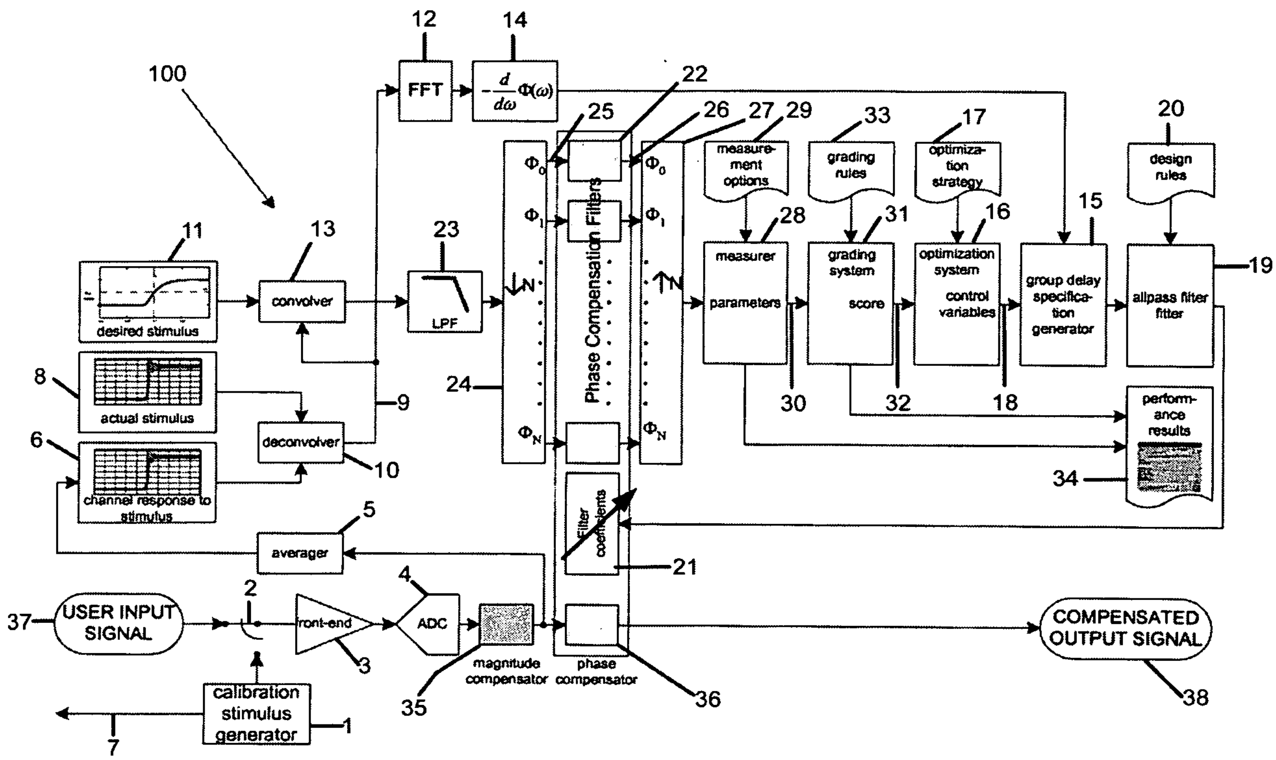


Figure 1 – Group Delay Compensator

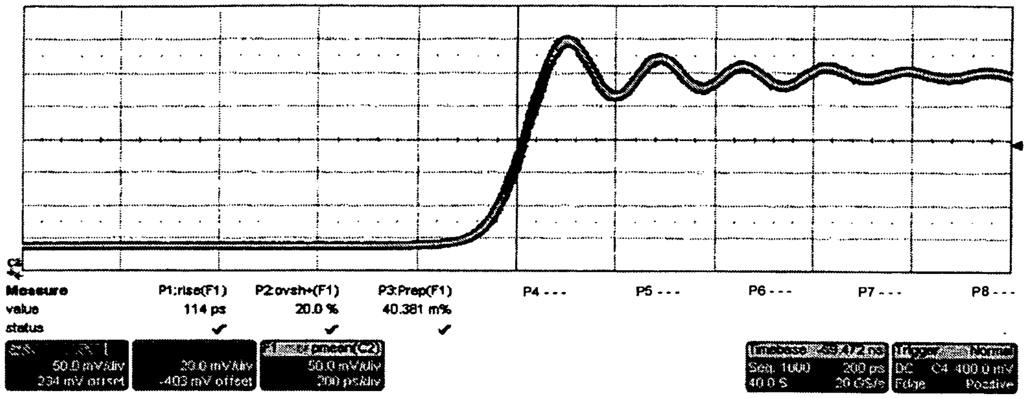


Figure 2 - WM8600A Channel Step Response Exhibiting Poor Group Delay Characteristics

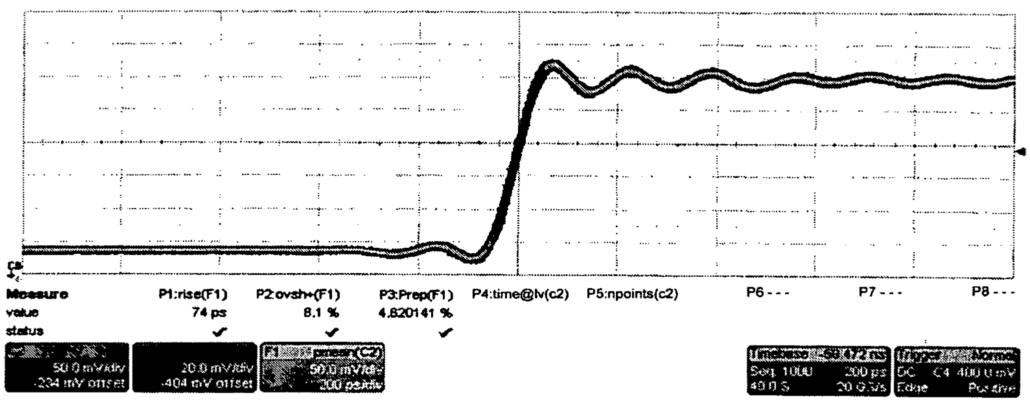


Figure 3 - WM8600A Channel Step Response Resulting From Improper Group Delay Compensation

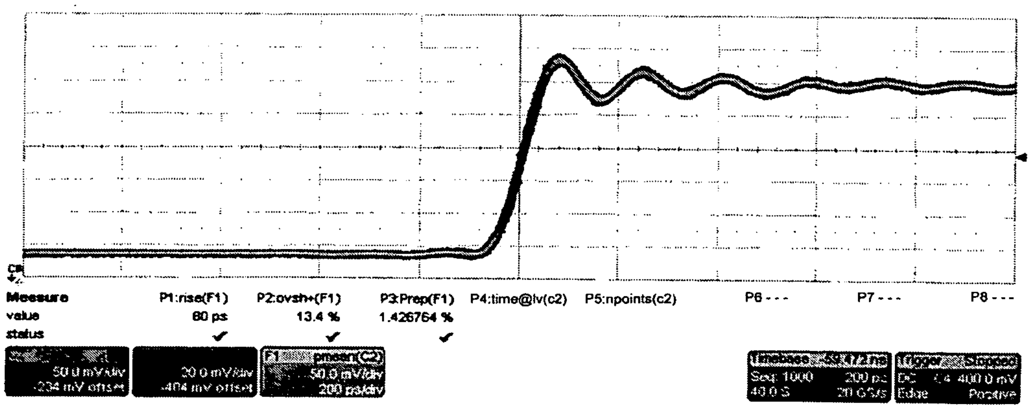


Figure 4 –WM8600A Channel Step Response with Proper Group Delay Compensation

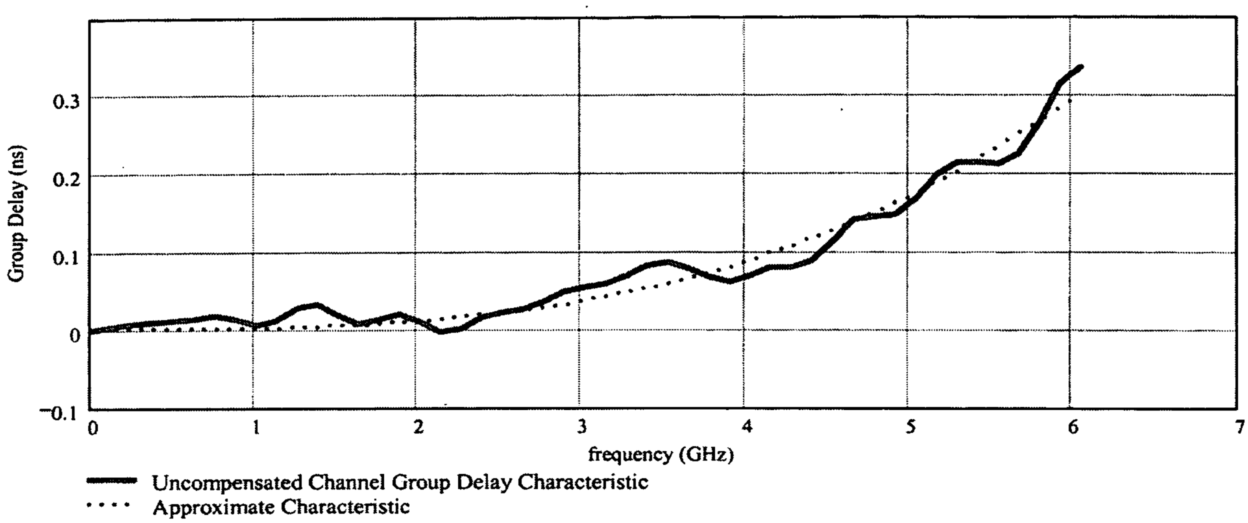


Figure 5 – Uncompensated Channel Group Delay Characteristic

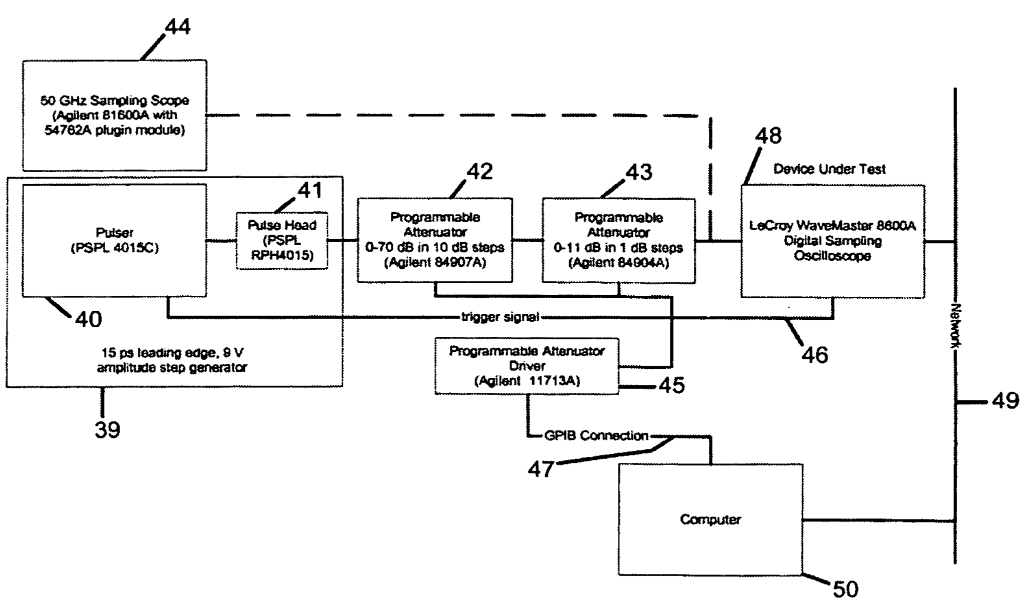


Figure 6 – WaveMaster 8600A Calibration Arrangement

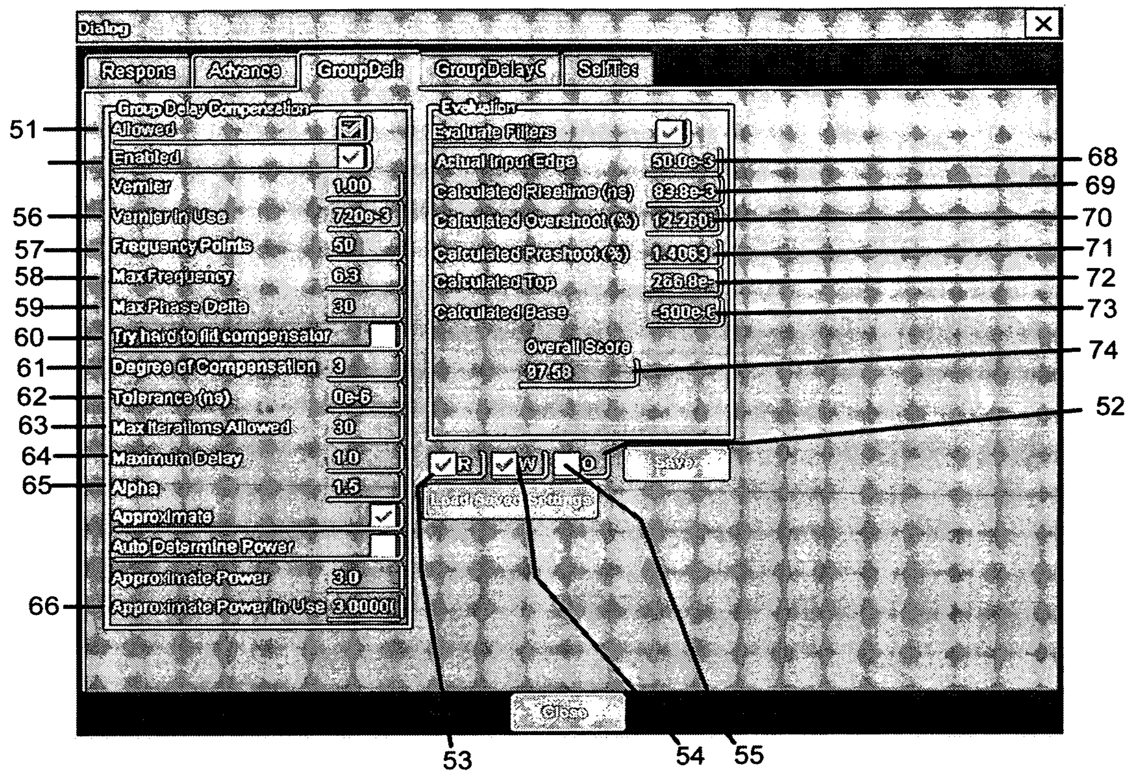


Figure 7 – Dialog Showing Allpass Filter Fitter options and Final Filter Evaluation

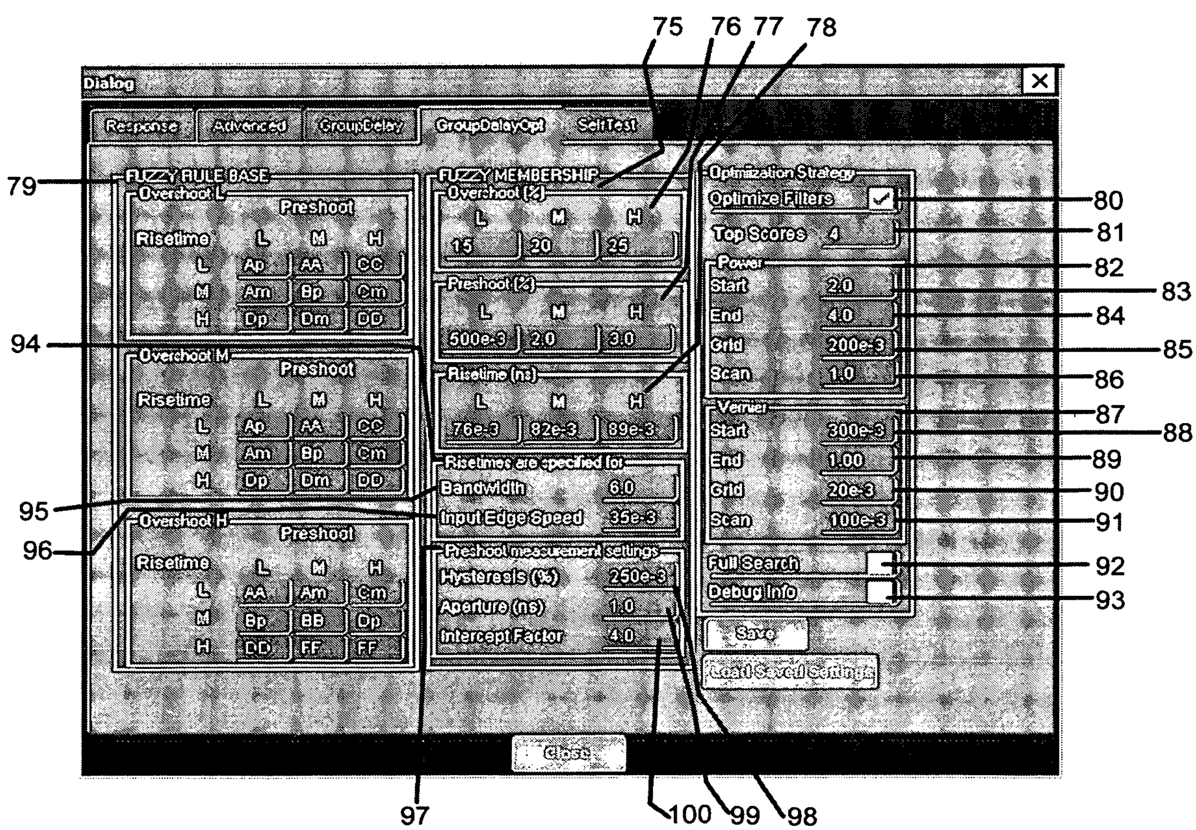


Figure 8 - Dialog Showing Grading Options and Optimization Strategy Options

1	for n=0 ... N	for each response point
2	$R_n = GD_{comprel}(f_n, g_{i-1}) + gd_{spec_n}$	calculate a residual
3	for j=0 ... 2S-1	for each coefficient
4	$J_{n,j} = \dfrac{\partial}{\partial (g_{i-1})_j} GD_{comprel}(f_n, g_{i-1})$	calculate an element of the Jacobian matrix
5	$H = J^T \cdot W \cdot J$	calculate the approximate Hessian matrix
6	for j=0 ... 2S-1	generate a matrix whose diagonal is identical to the Hessian matrix and is zero elsewhere
7	$D_{j,j} = H_{j,j}$	
8	$\Delta P = (H + \lambda \cdot D)^{-1} \cdot J^T \cdot W \cdot R$	calculate the change in coefficient values
9	$g_i = g_{i-1} - \Delta P$	apply the change to the coefficients
10	$mse_i = \dfrac{1}{N+1} \cdot \sum_n \left(gd_{spec_n} + GD_{comprel}(f_n, g_{i-1})\right)^2$	calculate the new mean-squared error
11	$mse_i > mse_{i-1}$ — true / false	did the mean squared error increase?
12	true: $\lambda = \lambda \cdot 10$ (favor steepest decent); false: $\lambda = \dfrac{\lambda}{10}$ (favor Newton-Gauss convergence)	

Figure 9 – An Iteration of the Levenberg-Marquardt Algorithm during Allpass Filter Fit

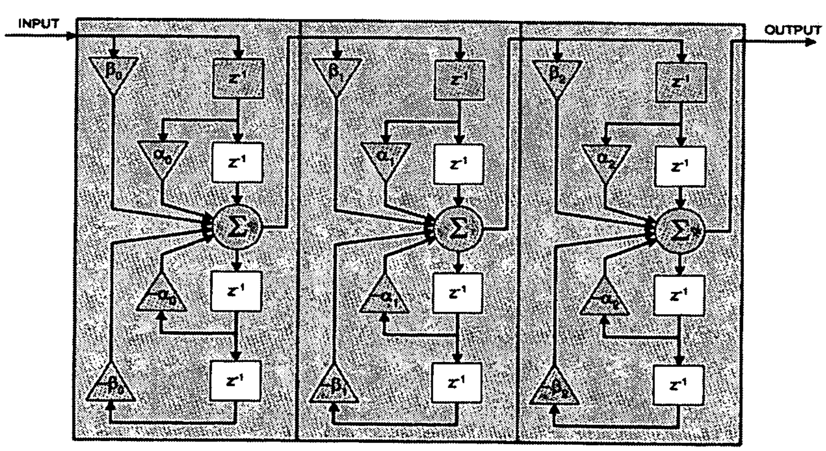
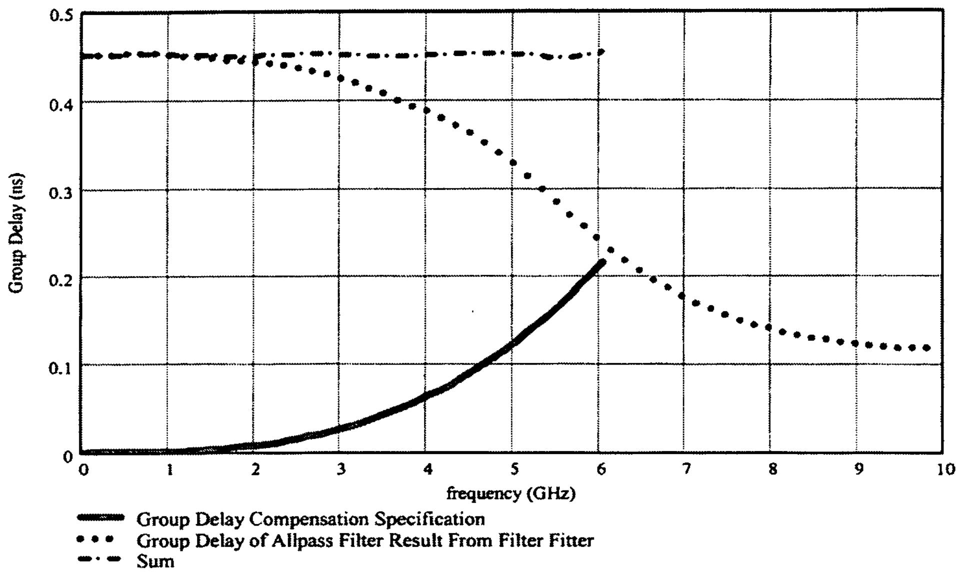


Figure 10 – A Three-Section (Sixth Order) Digital Allpass Filter



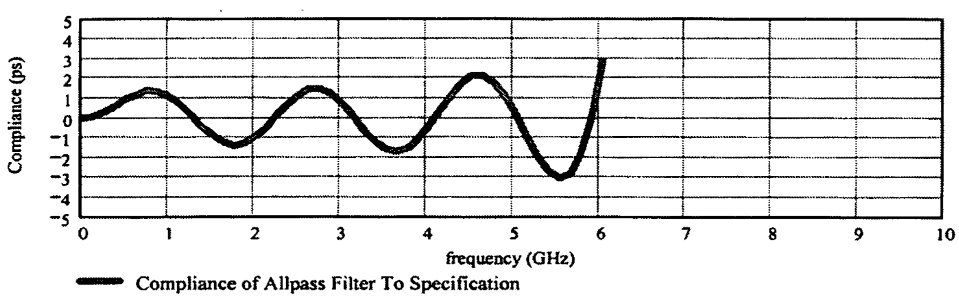


Figure 11 – Result of Allpass Filter Fit to Group Delay Compensation Specification

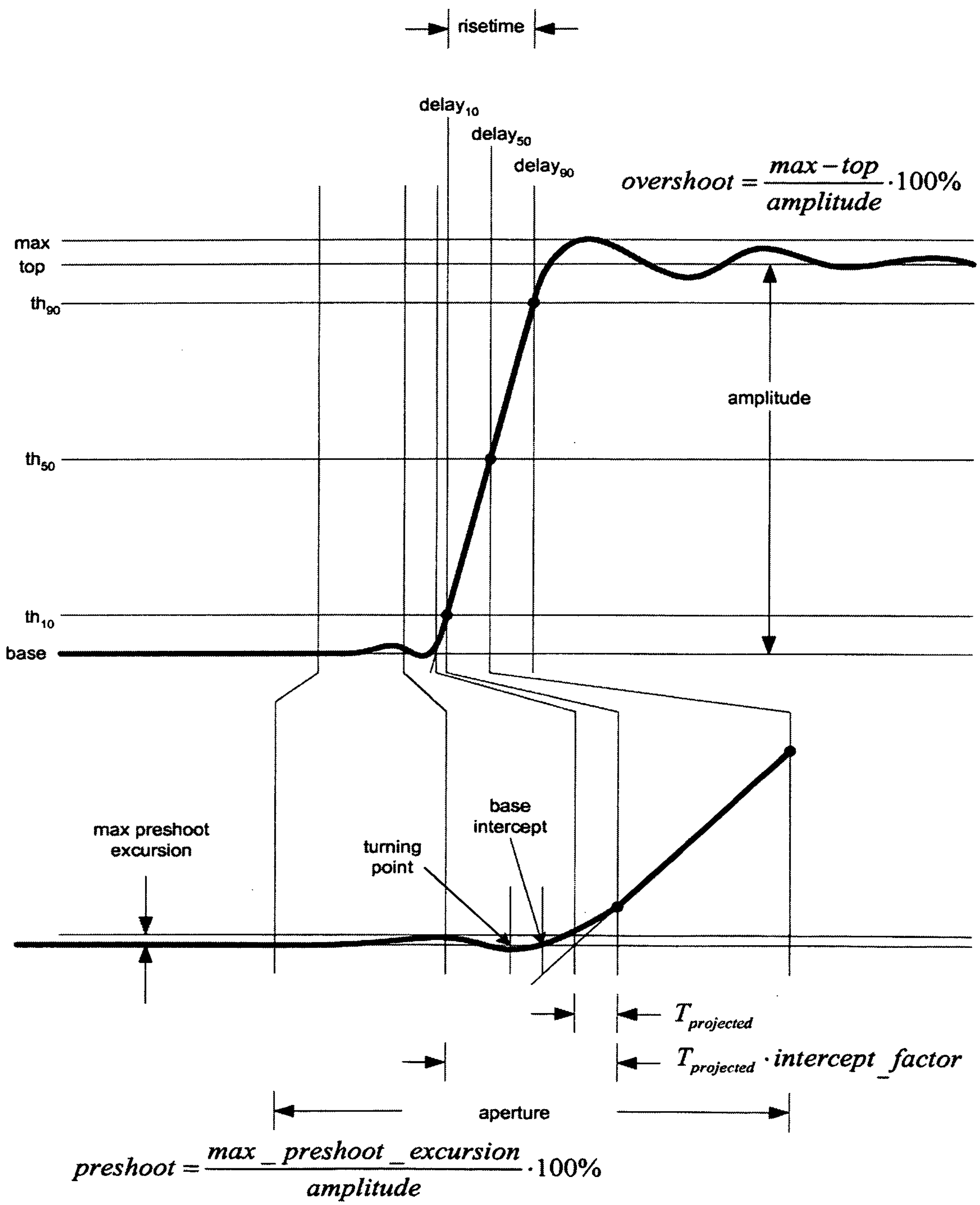


Figure 12 – Definitions of Risetime, Overshoot, and Preshoot Measurements

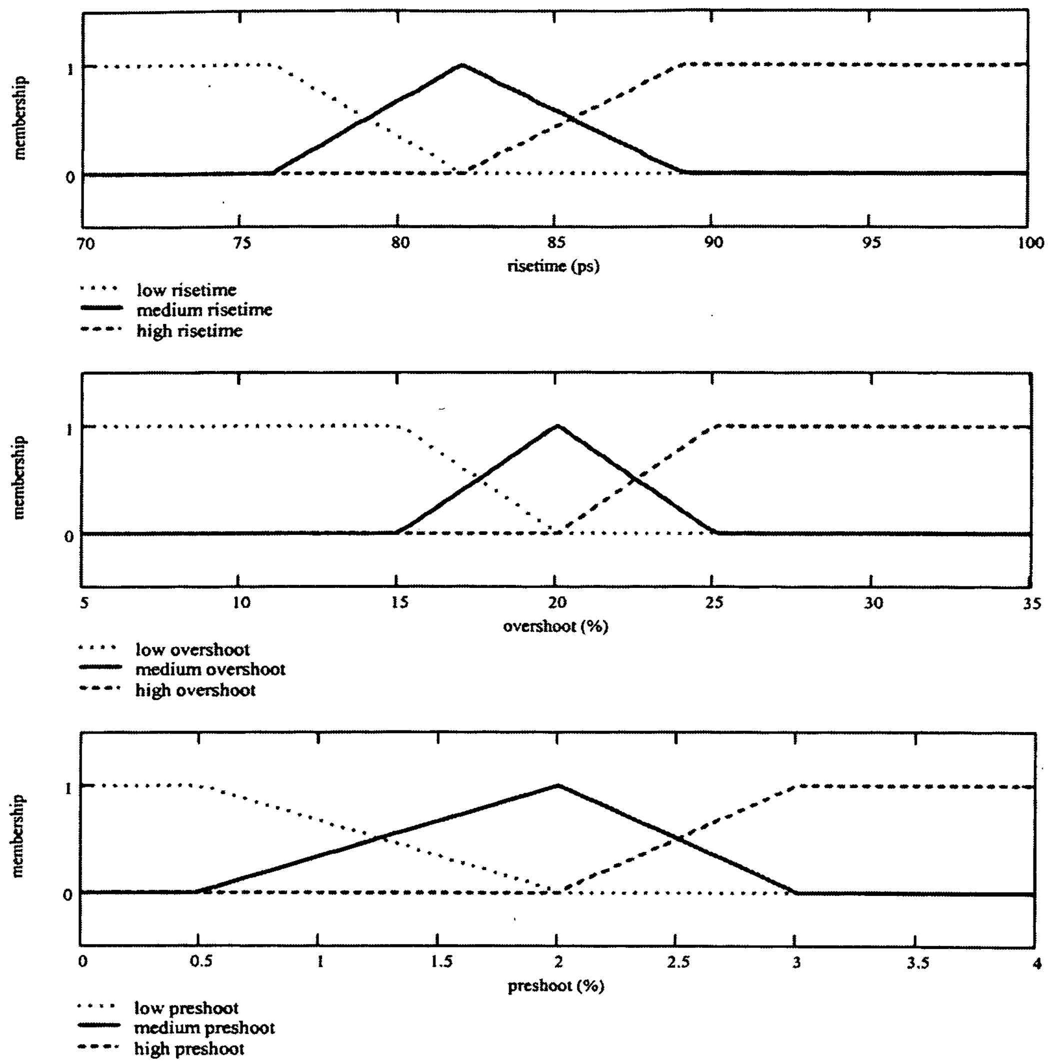


Figure 13 – Fuzzy Membership

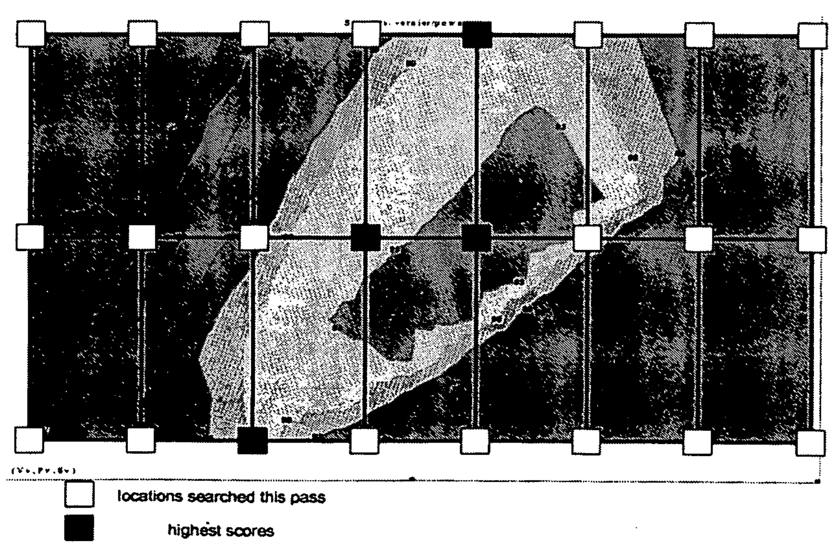


Figure 14 – Initial Optimization Scan and Result

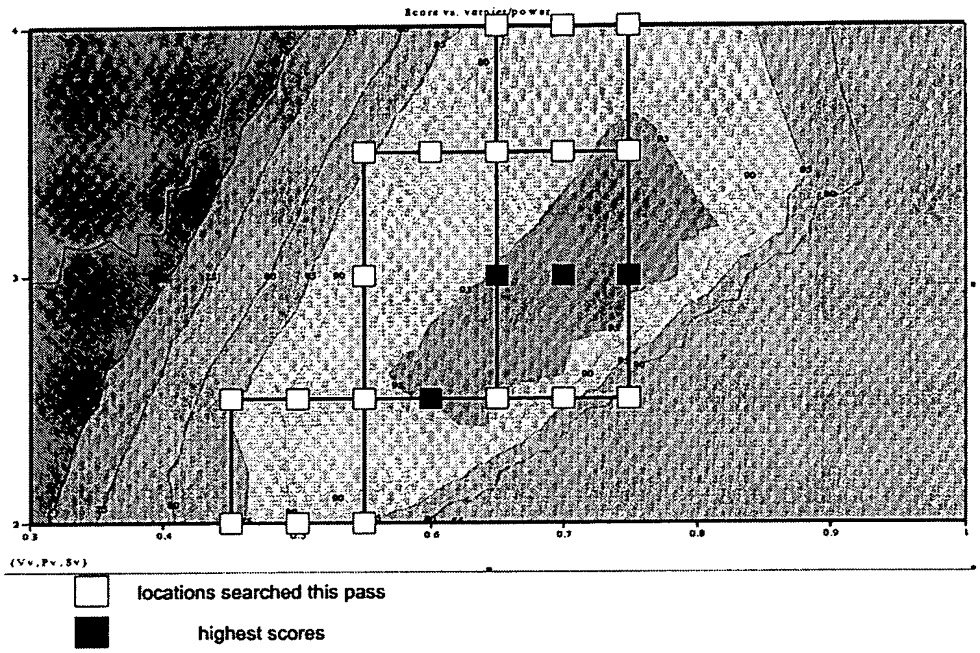


Figure 15 – Second Optimization Scan and Result

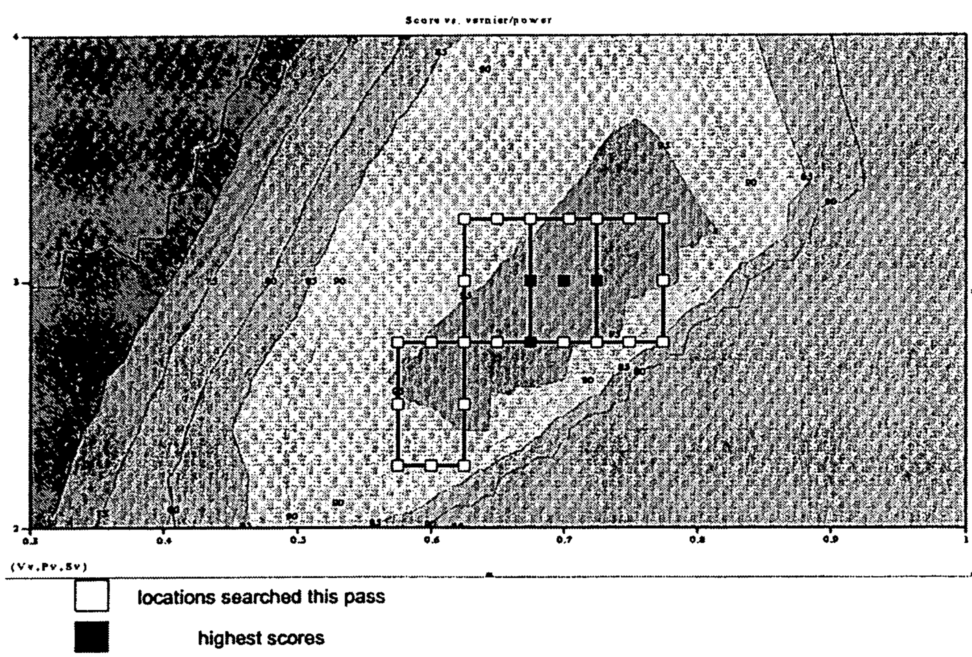


Figure 16 – Third Optimization Scan and Result

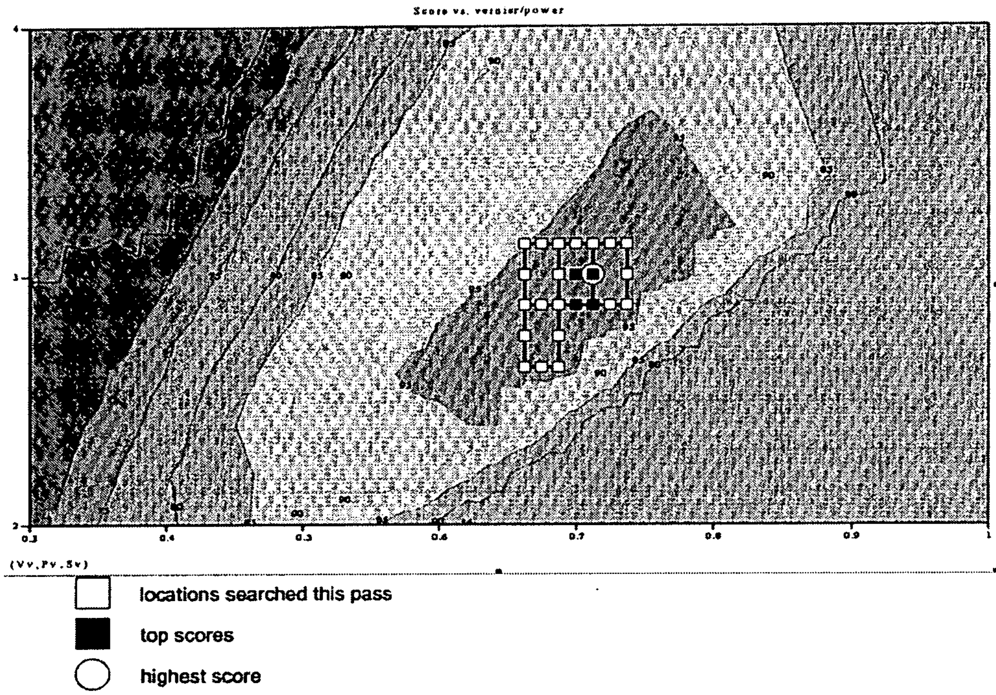
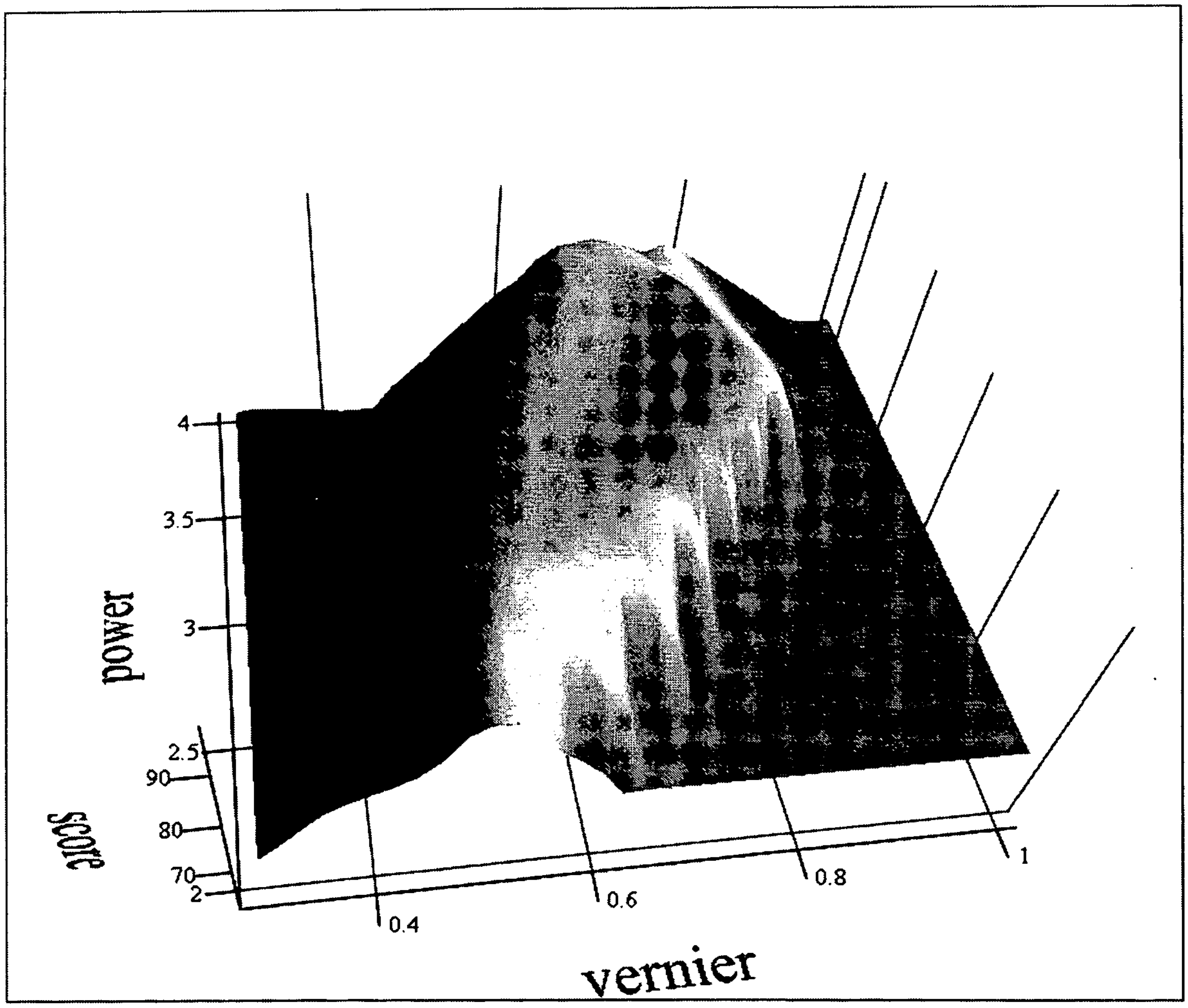


Figure 17 – Fourth Optimization Scan and Result



(Vv, Pv, Sv)

Figure 18 – Score vs. Optimization System Output Variables

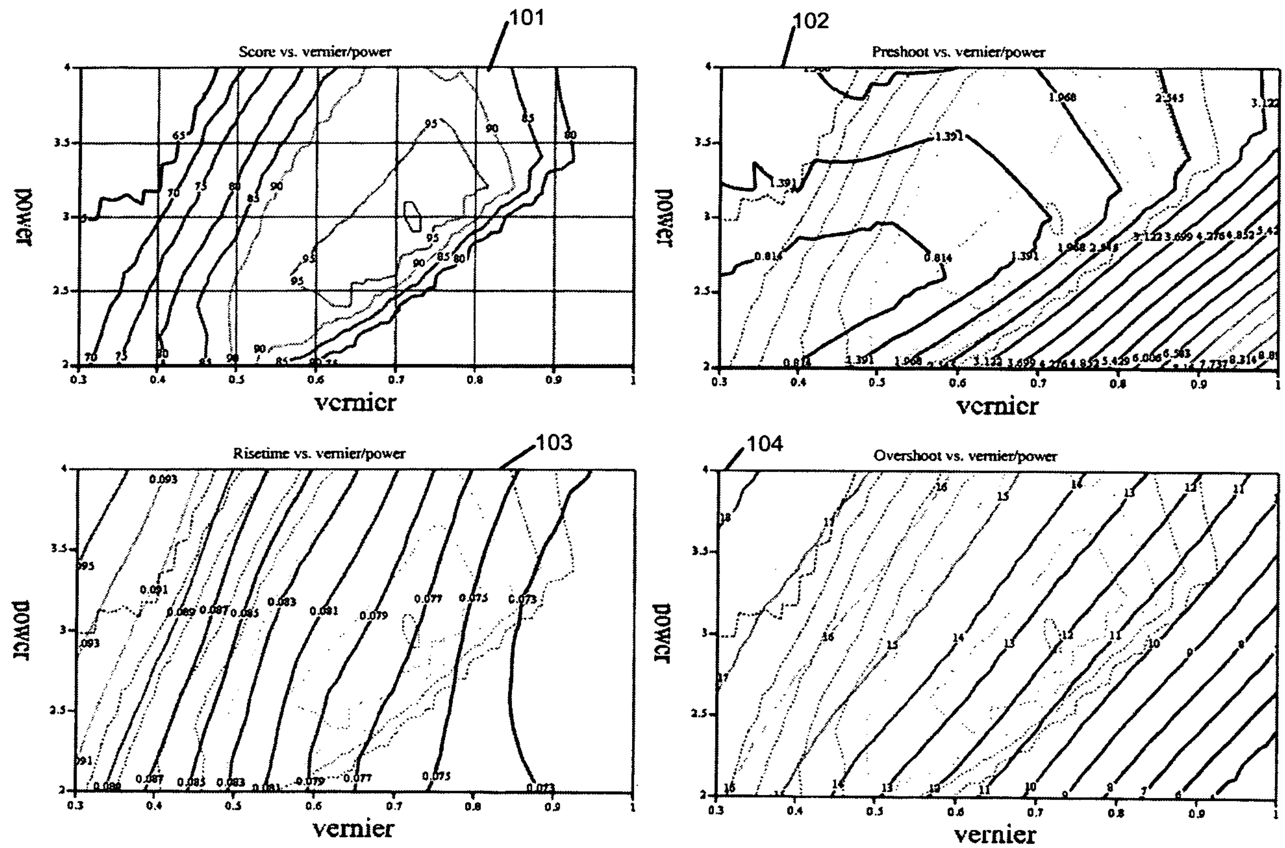


Figure 19 – Score and Measurer Parameter Outputs vs. Optimization System Output Control Variables

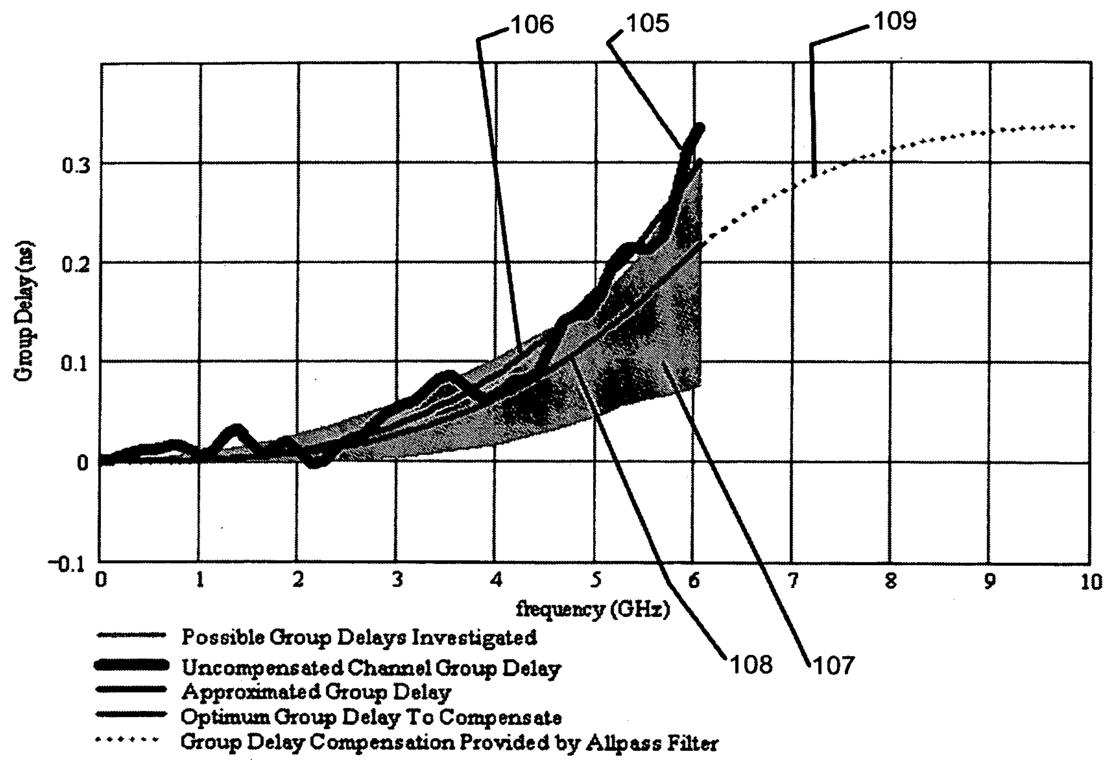


Figure 20 – Optimization Region and Result

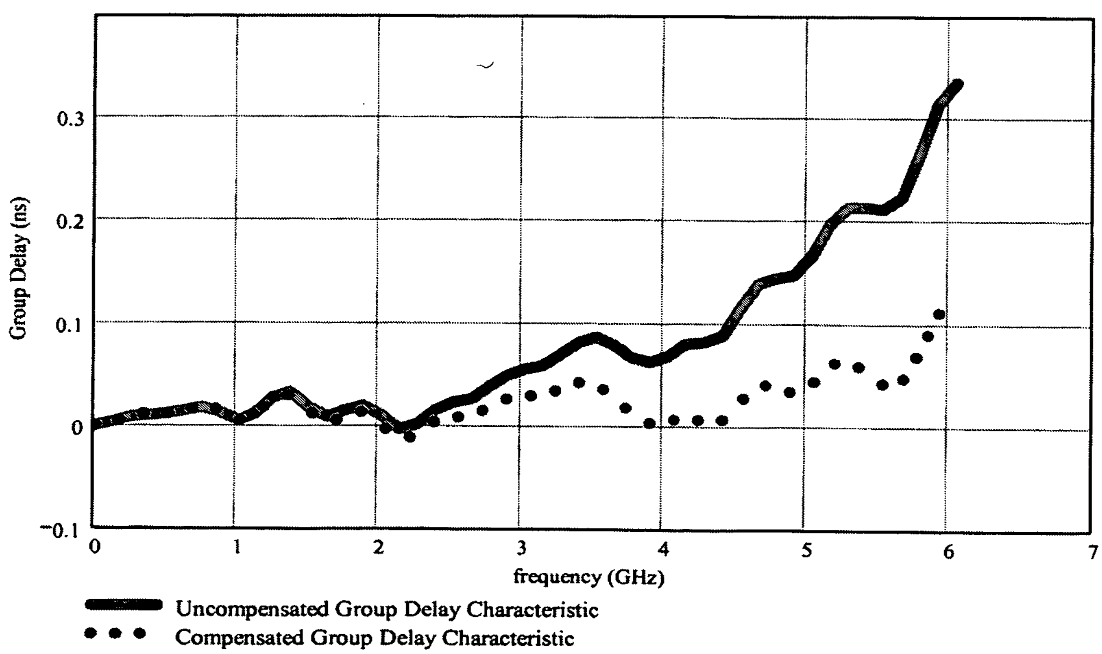


Figure 21 – Comparison of Uncompensated and Compensated Group Delay